CHEM 690: Laboratory Safety
Spring 2016

Instructors:

- Gary Baker, Director of Graduate Studies and Assistant Chair.
- Andy Small, Lab Manager.
- Michele Crase, Lab Safety Manager, Office of Research, Integrity and Safety.
- James Gable, Chemical Safety Officer, Office of Research Compliance, Integrity and Safety.

Office hours:

Flexible, please contact an instructor during class or email your availability times to set up an appointment.

Course Time/Location:

Friday, 3:00 to 3:50 p.m., in LaTourette (LaT) 201.

General Course Description and Rationale:

Graduate students are engaged in both research and teaching in laboratory environments and must be able to apply and model effective safety practices in both settings. Their teaching may be as Teaching Assistants in undergraduate instructional laboratories, but it may also be in high school laboratories for those pursuing Teacher Licensure. Their research often involves mentoring undergraduate students and doing laboratory work where hazards are less predictable, thus requiring additional training, education, and accountability. While pursuing research, graduate students must also acquire skills to become independent investigators in academic, industrial, or government workplaces. This course, through engaged classroom and field experiences and through speakers from industry and government, will 1) provide a well-organized safety program with the goal of strengthening our safety culture, 2) provide the knowledge and skills to perform safe instruction and research, and 3) increase preparedness for not only academic careers in teaching and research, but also careers in industry and government.

Student Learning Outcomes (LSC = Lab Safety Course)

Graduate students will be able to:

SLO 1 LSC: Develop and model specific behaviors that identify a culture of safety practice in both teaching and research laboratories.

SLO 2 LSC: Demonstrate detailed knowledge of safety practices in chemical industries and government facilities that excel in these practices.

SLO 3 LSC: Showcase an ability to maintain a safe laboratory environment as a "hypothetical" new chemist entering the workforce.

SLO 4 LSC: Provide thoughtful compare-and-contrast discussion of chemical hygiene practices/responsibilities in academic, industrial, and government research laboratories.

SLO 5 LSC: Articulate detailed knowledge of guidelines/practices for working with hazardous substances (i.e. high toxicity chemicals, radioactive substances, flammable chemicals, highly reactive or explosive chemicals, nanoparticles, etc.).

Course References

- **Prudent Practices in the Laboratory**, National Academies Press, 2011, http://www.ncbi.nlm.nih.gov/books/NBK55878.
- **Safety in Academic Chemistry Laboratories**: Vol 1, American Chemical Society, 2003, https://www.binghamton.edu/watson/research/pdfs/acs-labsafety-studyguide.pdf.
- **Biosafety in Microbiological and Biomedical Laboratories (BMBL)** 5th Edition, 2009, Centers for Disease Control and Prevention, http://www.cdc.gov/biosafety/publications/bmbl5.

Governmental Regulations

- OSHA RCRA, OSHA Laboratory Standard, OSHA Bloodborne Pathogen Standards, ANSI/ASHRAE Standards.

Speakers

Two guest speakers, one from BP and the other from Argonne, will present to the class about their safety programs.

Week:	Tentative Topics Outline	Presenter	Date
1	History of safety culture in industry: Accidents and injuries. Governmental regulations: OSHA, EPA. Hazards/risk assessment. Development. Types of assessment tools. Practical uses.	Course overview by G. Baker M. Crase	1/22
2	Personal Protective Equipment (PPE): Risks, regulations, accidents. Lab coats – types, protection. Goggles/glasses – types, protection. Gloves – types, protection. Respirators – types, protection.	J. Gable	1/29
3	Development of a safety culture in the research laboratory: Components of a safety culture. Types of safety cultures.	A. Small	2/5 **QUIZ**
4	Working with chemicals: Hazard Communication, GHS. Hazard Classes, hazardous materials. Chemical ordering, storage. Toxicology.	J. Gable/ A. Small	2/12
5	Chemical safety:	J. Gable/ A. Small	2/19 **QUIZ**

	Risks, regulations, accidents. Risk rating systems. Laboratory safety standard components. Emergency response, security.		
6	Chemical fume hood: Lab equipment. Compressed and cryogenic gases. Lab design.	J. Gable/ A. Small	2/26
7	Chemical safety and the EPA: Risks, regulations and accidents. Disposal of hazardous materials. Lab decommissioning. Hazardous materials shipping. DOT, IATA.	J. Gable/ A. Small	3/4 **QUIZ**
8	Biosafety: Risks, regulations, accidents. Biosafety levels. Disinfection and sterilization. Disinfectants - types and use. Autoclave use. Emergency response and security. Biosafety manual.	M. Crase	3/11
	SPRING BREAK		3/18
9	Radiation safety: Risks, regulations, accidents. Liquid material. Sealed sources. X-Ray producing equipmen.t Radiation Safety Manual. Laser safety. Types of lasers. Hazards. Emergency response and security. Laser Safety Manual.	M. Crase	3/25 **QUIZ**
10	Field Trip: Visit Clinical Laboratory, DuSable in Hall.	Ellen Olsen Medical Lab Sciences	4/1 **QUIZ (Lab Audit)**
11	Visiting speaker – Industrial research lab	Garrick Milkeris, BP Amoco	4/8

12	Visiting speaker - Governmental research lab	Nancy VanWermeskerken Argonne	4/15
13	Other laboratory hazards: Risks, regulations, accidents. Electrical. Slips, trips, and falls.	EH&S	4/22
14	Course review and group discussion		4/29

Course Format

This course is a combination of lecture and group discussions. All course resources will be posted on Blackboard. Students should review the appropriate material before each class.

Criteria for a Satisfactory Grade (CHEM 690 is graded S, U, or I)

- No more than three excused absences due to professional or personal reasons. The student must email the Director of Graduate Studies with an explanation at least 24 hours prior to the class the student will miss. Emergencies sometimes arise. These will be handled case-by-case.
- At least 80% on each of five quizzes given throughout the semester. The quiz schedule and content expectations will be given in class. The quizzes will assess detailed knowledge of the NIU Chemical Hygiene Plan, emergency procedures, evaluation of hazards/risk assessment, and working with chemicals.
- Participation in group discussions of chemical safety scenarios and other course topics.
- A) Propose a simple research project as a hypothetical new investigator and showcase how you would maintain a safe laboratory environment as a new chemist entering the workforce.
  OR
  B) Write a reflective compare-and-contrast paper on chemical hygiene responsibilities in academic, industrial, and governmental research laboratories (based, in part, on the guest speaker presentations).

A grade of "I" or "U" will be assigned if any of the above criteria are not met.

Academic Integrity

Northern Illinois University is a learning community. Consistent with the mission and purpose the University seeks to foster within its whole community, it is expected that academic honesty and integrity guide the actions of all its members. It is the responsibility of every person in the academic community – faculty members, students and administrators – to ensure that **academic dishonesty is not tolerated.**

Accommodations

If you need an accommodation for this class, please contact the Disability Resource Center as soon as possible. The DRC coordinates accommodations for students with disabilities. It is located on the 4th floor of the Health Services Building, and can be reached at 815-753-1303 (V) or drc@niu.edu.